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Should we teach cooking in schools? A systematic review of the literature of school-based cooking interventions

Annie Seeley
Michelle Wu
Professor Martin Caraher, PhD

Abstract

This paper reports the findings from a systematic review of the impact of practical cooking initiatives in schools. We draw out recommendations that could inform home economics interventions in schools and evaluations thereof. A systematic search was undertaken for articles published between 1995 and January 2008; this was supplemented by hand searches. Studies were reviewed and classified on a scale of 1 to 4 (1 = highest quality) according to reported methodological quality of evidence provided.

Four papers were found that met the criteria for inclusion as evidence. The only intervention to be ranked as level 1 was one that delivered a mix of food and environment lessons (theory-based), practical cooking sessions, parental involvement and provision of plant-based foods at school lunch. Three studies met the level 2 standard of the review. One of these, based in the United States of America (USA), was a randomised control trial of an intervention over 6–8 weeks for low-income youth consisting of food tasting, fruit and vegetable preparation as well as other activities. The second was a one-group cohort, 'before and after' intervention that targeted 'gypsy' children in Bilbao, Spain. This involved school teachers, nutritionists and catering staff. Following intervention, 95% had increased knowledge scores, 60% reported preparing dishes made in the sessions at home, and increases in cooking confidence and consumption of fruit, vegetables, dairy and fish were also reported. The final study was an interactive computer-based intervention where pupils virtually prepared a fruit juice or vegetable recipe on a computer program and then prepared recipes for homework in their home kitchen. The results demonstrated an increase in post-test consumption, although this was associated with baseline consumption.

All the studies were short-term and none included long-term follow up so outcomes are not known. There is some evidence for an association between teaching cooking skills and improved nutrition knowledge, changing food preferences, increased confidence in cooking skills and healthier eating habits. However, while cooking lessons per se may positively affect consumption and attitude in the short-term, there was no long-term follow up and the review found very limited evidence on which to base policy.

Introduction

This review presents the findings from a systematised literature review of cooking in the school setting. The studies that fit within the research scope are described and evaluated. Examples of good practice are drawn out and, where appropriate, questions that can inform cooking interventions are highlighted.

The systematic literature review demonstrates the best available evidence for or against the proposition that teaching cooking improves eating behaviour, rather than demonstrating whether a causal link does or does not exist. The evaluation and research studies that demonstrate this link may not yet have been carried out. We are working from a position of best available evidence in relation to what works. Cooking may have all sorts of benefits that have not yet been explored or investigated.

With increases in obesity and overweight in developed countries, cooking in schools is increasingly being included in obesity-prevention strategies. Many home economics curricula are designed to impart general cooking skills as a life skill. But how is the impact measured and how can this systematic review inform an evaluation of home economics education? We pick these issues up in the discussion at the end of the paper and address some of the difficulties in adopting a position whereby cooking is seen as an antidote to wider social ills such as obesity or family breakdown.

Annie Seeley *BSc (Hons) RPHNut*
Centre for Food Policy
City University
Northampton Square
London EC1V 0HB
United Kingdom
Tel: 44 207 040 3204
Email: annie.seeley@city.ac.uk

Michelle Wu *BSc (Hons), MSc*
Centre for Food Policy
City University
Northampton Square
London EC1V 0HB
United Kingdom
Email: michelle.wu.1@city.ac.uk

Professor Martin Caraher *PhD*
Centre for Food Policy
City University
Northampton Square
London EC1V 0HB
United Kingdom
Tel: 44 20 7040 4161
Email: m.caraher@city.ac.uk

"Cooking in schools is increasingly being included in obesity-prevention strategies"

Methodology

The aims of the review were to:

- identify interventions in the school setting that had as their aim the teaching of practical cooking/food preparation skills to children
- assess the quality of these studies, their impacts and outcomes.

The method of this review was a systematic literature search for original publications in the following databases: MEDLINE, ERIC, SSCI, the British Education Index and the Australian Education Index. The initial searches identified 799 articles and, after an initial title scan, 37 titles were deemed relevant and the abstracts reviewed. Decisions were then made on whether to include these studies according to specific criteria. Reference lists, specific journals and conference proceedings were also searched by hand. After this process, 11 articles in total were identified for further consideration. Of these, upon examination of the full papers, one further article was excluded as it was judged not to be relevant and two articles did not arrive in time to be included[1]. The eight remaining articles went to full review by two independent reviewers and were classified according to the quality of the evidence provided, with evidence levels 1 and 2 subsequently included in the synthesis. The criteria developed by Caraher, Cowburn, and Currie (2003) were considered the most appropriate for the types of research in this field and informed the four levels of quality:

Level 1: A well-designed study, survey, or systematic review, often using randomised, controlled, quasi-experimental, intervention versus a control and comparison group or a pre- and post-test design including historical studies with academic rigour

Level 2: A study, survey or review of one of the four relevant policy areas

Level 3: Descriptive/anecdotal, well presented and relevant qualitative information

Level 4: Very general information, with little data but with subject relevance.

Results

Only four studies/programs met the academic quality criteria for inclusion as evidence. These are described below. Three were based in the United States of America (USA) and one was from Spain. We describe each of the four in turn and then present some additional evidence. A summary of the studies is found in Table 1.

Cookshop *program*

The first and only study providing level 1 evidence was the *Cookshop* program (Liquori, Koch, Contento & Castle, 1998), which had been previously identified by Caraher, Cowburn and Currie (2003) in a previous systematic review of school initiatives for the Department of Health. The intervention targeted urban, low-income children and used a quasi-experimental 'before and after' study design for evaluation. Classroom *Cookshops* were the key component of the intervention that included education, cooking, changes to school lunches and parental involvement. All parents in study schools received a monthly newsletter and all children received the school lunch component. Classes were allocated to receive one of four different interventions:

(1) *Cookshops* and Food & Environment Lessons (FEL)
(2) *Cookshops* only
(3) FEL only
(4) School lunch and parent information only (Comparison).

Cookshops were used to introduce children to new foods, with a focus on minimally processed whole grains and vegetables. Importantly, *Cookshops* allowed children to actively participate in chopping, tearing, stirring—that is, practically preparing food. Classroom teachers delivered the 10 cooking sessions, but with 25–30 children in each class, parents and volunteer college nutrition students were also involved as instructors. The results showed that, compared to classes receiving other components of the intervention, classes that had participated in *Cookshops* had a greater preference for plant foods, higher scores for knowledge and behavioural intention, and were more confident in their cooking ability, although this was only true in the older children. *Cookshops* also had the greatest effect on actual (observed) eating behaviour, with less of the included foods being left on the plates of participating children.

Expanded Food and Nutrition Education Program (EFNEP)

The second study that met the criteria for level 2 evidence was an evaluation of the USA Expanded Food and Nutrition Education Program (EFNEP). This was a randomised-controlled effectiveness trial of an intervention aimed at low-income youth (Townsend, Johns, Shilts & Farfan-Ramirez, 2006). The intervention consisted of seven school-based lessons taught over 6–8 weeks and included food tasting, food art, food puzzles, games, and preparation of fruits and vegetables. The evaluation of this study lacked detail on how the cooking component

[1] The literature review search strategy is available from the authors on request.

Table 1. Summary of results

Cookshop Program, USA (Liquori et al., 1998)

Design
Quasi-experimental with 4 groups and pre- and post-test measurements.
3 intervention groups (30 classes) and 1 comparison group (9 classes):
Group 1: CS+FEL
Group 2: CS only
Group 3: FEL only
Group 4: Comparison
Teachers in intervention and control groups matched to be as similar as possible. Classes also matched on reading level at each grade.

Sample
Urban, low-income primary school children, inner city Harlem
39 classes, kindergarten (K) to grade 6. N=590

Intervention components
Curriculum
- Food & Environment Lessons (FEL). Format: 45 minute x 10 lessons + experiential activities
- Content: Focus on understanding why whole foods are part of a healthful diet and sustainable 'good for the earth'. Experiential: 17 class trips to community garden

Cooking
- 10 'Cookshops' (CS): 1 intro and 9 cooking sessions. Format: Children work in small groups at stations facilitated by an adult.
- Content: Different food focus each week, learning about different parts of plants. Recipes can be made within 60–90 minutes.

School meals
- School lunch component: Increased diversity of vegetables and whole grains served.
- 13 foods introduced in the Cookshops were served in the lunchroom, seasonal as much as possible.
- Program staff visited each school cafeteria weekly to monitor and give support

Other
- Parent newsletter: information on buying, storing and preparing whole grains and vegetables introduced by the Cookshops.
- Some parents involved as Cookshop instructors

How evaluated
Questionnaire administered, two versions: K to grade 3 (38 questions) and grades 4–6 (67 questions). Questionnaire was read aloud and consisted of five scales:
1. Preferences for plant foods
2. Attitudes
3. Knowledge (specific to the curriculum taught)
4. Cooking self-efficacy
5. Behavioural intentions to eat plant foods

Plate waste was determined by visual estimate in school cafeteria.

Key findings at post-test
Preferences for plant foods:
- Higher mean scores in CS groups. FEL alone had no effect.

Attitudes:
- All groups no effect.

Knowledge:
- Improved in CS and FEL groups. In younger classes, both types of intervention had similar impact. CS had much greater impact than FEL in older classes.

Cooking self-efficacy:
- Improved in older children receiving CS. FEL alone no effect.

Behavioural intentions:
- Higher scores for CS groups.

Plate waste:
- CS+FEL group left the least targeted foods on their plates, 79% and 74% in younger and older classes, respectively, followed by CS alone, leaving 84% and 78% respectively.

Expanded Food and Nutrition Education Program, USA *(EFNEP)* (Townsend et al., 2006)

Design
RCT with 2 groups and pre- and post-test measurements.
Group 1: Intervention (3586 children, 162 groups)
Group 2: Control (1526 children, 67 groups)

Sample
Low-income children, aged 9–11 years, 10 counties in California. N=5111

Intervention components
Curriculum
- Adapted from *Eating Right is Basic* curriculum.
- Format: 7 lessons taught over 6–8 weeks
- Content: Experiential activities included food tasting, food art, food puzzles, games and preparation of fruits and vegetables.

Cooking
- No detail given on the cooking component other than what is reported for curriculum. However, *Cooking up fun!* by Thonney et al. (2006) is one example of an intervention used by EFNEP.

Other
- Training of leaders (classroom teachers and after-school program staff) by EFNEP staff. 1–2 hour workshops, train-the-trainer model.
- Monitoring attempted through leader implementation questionnaires: leaders asked to identify dose and document activities.
- Incentives provided (vouchers for local supermarket)

How evaluated
Questionnaire administered: Kids Kartoons, a cartoon style booklet designed specifically for the intervention. Multiple choice questions covering four indicators:
1. Eat a variety of foods
2. Nutrition knowledge
3. Food selection
4. Food preparation skills and safety practices

Questionnaire was read aloud and participants selected answers on a scannable response sheet.

Key findings—Difference in pre/post test change score
Eat a variety of foods:
- No difference between intervention and control groups.

Nutrition knowledge:
- Intervention group had significantly greater change.

Food selection:
- Intervention group had significantly greater change.

Food preparation and safety practices:
- Intervention group had significantly greater change

Bilbao 'gypsy' study, Spain (Perez-Rodrigo & Aranceta, 1997)

Design
Single group, pre- and post-test measurements.

Sample
Gypsy children (75%), aged 8–12 years, attending a public school in poorest district of Bilbao. Children with learning difficulties included and materials adapted to meet their needs. N=150

Intervention components
Curriculum
- Format: Lessons taught over the school year, integrated into various subjects. Methods used include: short talks, games, drawing, crafts, food exhibitions.
- Content: Basic knowledge about food and nutrition, function of nutrients, food groups, role of nutrition in growth and development, how to read food labels, how to plan a healthy diet on a low budget, hygiene and table manners

Cooking
- Food preparation workshops: Held in school kitchen/ lunchroom; 2-hour session/week x 5 weeks.
- Format: Groups of 15 children prepared dishes supervised by cook and teacher.
- Content: Each session focused on a single food group. Sessions included multimedia teaching, games and crafts.
- Recipe preparation, with main ingredients from food group of the day formed the core of the session. At the end, children set the table, sat down together with teaching staff and ate the meal they prepared.

School meals
- School lunch menus designed according to children's nutritional requirements and food preferences. Menus comprised of 35% RDA for energy, protein, calcium, and iron. Pulses offered 3d/week, fish 2d/ week, fruit 2–3d /week, vegetables every day, yoghurt-cheese 2–3 d/ week and whole grain bread once a week.

Other
- Parents were invited to various meetings at the school and reimbursed for the costs of workshop materials.
- Toothbrushes provided to every child.

How evaluated
- Multiple choice questions on knowledge and skills.
- FFQ completed during personal interviews with children.
- Self-perception assessed by semi-structured interview.
- Menu acceptance directly observed, Likert-type scales used to score

Key findings after 2 years of program implementation:
Knowledge:
- 95% had higher scores for knowledge of hygiene, foods groups, relating foods to health, food preparation, safety and reading food labels.

Cooking skills:
- A significant increase in post-test scores (but no detail on questions used to assess cooking skills). 60% of children prepared at home some of the dishes they had tried in the food preparation workshops.

Eating habits:
- FFQ showed an increase in fruit, salad, fish, and milk/dairy product consumption.

Acceptance of program:
- Positive attitude towards program and activities.

Menu acceptance:
- Gradual acceptance observed, especially of vegetables, fruit and fish (no data reported).

Squire's Quest!, USA (Cullen et al., 2007)

Design
Single group, pre- and post-test measurements.
Part of a larger RCT but for the purposes of this analysis of goal setting, only those assigned to the intervention group were included.

Sample
4th grade students (aged 8–9 years), 43% African American, 31% Hispanic, Houston. N=671

Intervention components
Curriculum
- Interactive computer program, adaptation of the *Gimme 5* classroom curriculum.
- Format: 10-session computer game. 2 session/week x 5 weeks
- Content: Activities promoting asking behaviour, food preparation, produce shopping, fast food selection, problem solving, goal setting, self-regulation and self-reward skills in relation to eating fruit, juice, and vegetables.
- All sessions included setting a goal to eat a fruit or vegetable

Cooking
- Format: 6 sessions
- Content: The goal selected was to prepare a fruit-juice or vegetable recipe from a menu of recipes, and prepare it in the virtual kitchen. Students were guided to prepare recipe at home and a copy printed out for home use. Each student was assigned a dietary change goal and then chose a recipe preparation goal. A parent/ guardian signed a form verifying whether the child had achieved the goal. Results were then entered into the program database and software provided children with positive rewards for attained goals, (e.g., points to attain knighthood levels).

How evaluated
- 24-hour dietary recall program used: Food intake recording software system.
- Preferences measured using preference scales for 17 vegetable, 10 fruit, and 3 100% fruit juice items.
- Reliance on parent-reported achievement of dietary change goal and recipe preparation goal

Key findings at post-test
Dietary change:
- An average increase of 1.0 fruit, 100% fruit juice, and non-fried vegetable servings, combined.

Recipe goal setting:
- Mean per cent of fruit-juice recipe goals attained = 56% and 65% for boys and girls, respectively; vegetable recipe goals attained = 53% and 65% for boys and girls, respectively.
- Post fruit and juice consumption depended largely on baseline consumption and to a lesser extent, on the number of recipe preparation goals achieved e.g. children with a baseline fruit-juice consumption of zero had only 'modest benefit' from achieving one recipe goal and no benefit beyond achieving one goal.
- Similar results were found for vegetable consumption: those with high baseline values had a significant increase post intervention. Little additional consumption for achieving more vegetable preparation goals.

was conducted. A key feature of the evaluation was the emphasis on monitoring to ensure that the program had been properly and completely implemented. A change score was devised to measure pre- and post-scores for both groups in nutrition knowledge, food selection, food preparation skills and food safety practice. The study found that children who received the intervention demonstrated statistically significant improvements for all areas, except the selection of foods where the intervention did not increase the variety of foods eaten. The control group scores also moved in the positive direction, however this trend was not statistically significant. Data were collected using a booklet with questions and cartoons. The methodology was validated and was shown to be reliable.

Bilbao 'gypsy' study

Another level 2 quality study was an intervention targeted at 'gypsy' children attending a state school in one of the most deprived areas of Bilbao, Spain. It used a single group 'before and after' study design (Perez-Rodrigo & Aranceta, 1997). Food preparation workshops were held in the school kitchen and lunchroom, one 2-hour session per week over five weeks, and involved classroom teachers, nutritionists and school cooking personnel. Similar to the *Cookshop* program, these practical workshops were one component of an intervention that included education, changes to school lunches and parental involvement. Classroom lessons were integrated into various subjects and taught over the school year. After two years of program implementation, 95% of children had higher knowledge scores, 60% of children reported preparing at home some of the dishes they had tried in the workshops, and scores for cooking skills increased significantly (although the authors do not report what the cooking score measures were). The study also showed an increase in the post-intervention consumption of fruit, vegetables, fish and dairy products. Though participation at parent meetings was low, parents were involved by providing materials such as aprons and clothing for the workshop, for which they were reimbursed.

Squires Quest! *study*

The last level 2 quality study was *Squires Quest!* It was a USA-based, interactive ten-session computer game intervention based on social cognitive theory, aimed at 4th grade students (Cullen, Watson, Zakeri, Baranowski & Baranowski, 2007). The intervention used a single group 'before and after' study design to evaluate the impact of setting recipe preparation goals (and achieving them) on the consumption of fruit juice and vegetables. Using the computer program, students selected a goal to prepare a fruit juice or vegetable recipe and prepare it in the virtual kitchen. Although the practical cooking occurred at home, the recipes indicated a reasonable degree of complexity. A parent/guardian was required to sign a form verifying whether the child had achieved the goals.

A major limitation of the study is the use of parents to report on the achievement of goals, which was not tested for validity. The authors also reported another limitation, in that no data were available on student access to ingredients or equipment in the home. The results demonstrated an increase in post-test consumption, but further analysis showed this to be related largely to baseline consumption and to a lesser extent, on the number of recipe preparation goals achieved. In other words, those with high baseline consumption figures were most successful in increasing their reported fruit and vegetable intakes and of less importance was the cooking skills element.

> *"Except the selection of foods where the intervention did not increase the variety of foods eaten"*

Discussion

Quality of the evidence

The literature search identified a very small number of relevant studies and, of these, only the four described above were of sufficient methodological quality to include in the review. Of these, only the study from Liquori et al. (1998) was regarded as level 1 evidence. The other three studies were of lower quality due to either a less rigorous study design or lack of certain details in reporting. The criteria set excluded numerous studies that either lacked a control or comparison group of some description and/or were qualitative research papers. Many of the studies excluded were of a descriptive nature, often doing little more than reporting on the process of setting up an intervention.

Cooking component

The quantity of research in this area was surprisingly small and although cooking or food preparation was listed as an activity in a number of multi-strategy obesity prevention studies, most of these articles lacked any description of the cooking component. Neither did they include measurement of any outcomes relating directly to cooking, using instead proxy indicators such as changes in dietary intake. All of the studies were of short-term interventions and none included longer-term follow up to determine the sustainability of program impacts. It should also be noted that even in the studies included, overall the conceptual detail and underpinning theories to support a practical cooking intervention were lacking in all but Liquori and colleagues' study.

Cooking skills
The measurement of cooking skills by self-perceived cooking confidence is prone to error, not least as a participant's level of confidence may not match their skill level. It is likely that cooking skills were not measured directly as developing a skills-set against which to measure, combined with training and funding assessors to measure skills directly, would increase a study's costs. However, measuring skill rather than confidence could provide a true measure of participants' ability. This approach could be combined with a self-efficacy measure of cooking confidence to measure participants' attitude and assurance in their cooking skills, as this could be an indicator of transference into the home environment.

Training of staff delivering the intervention
All papers provided scant details on training of staff delivering the intervention, though some description was given in the EFNEP paper (Townsend et al., 2006). The EFNEP paper detailed the training of treatment group leaders, which included classroom teachers, after-school program staff, summer day-camp staff, community agency personnel, and select teenagers. Participants took part in training workshops lasting between one and two hours, using a train-the-trainer model. EFNEP staff were trained to train teachers. The latter was conducted via a telephone conference call with a written protocol. Delivering training over the telephone may have contributed to group leaders not conforming to the study design.

Seventeen of the control group leaders delivered the complete intervention and those schools were therefore excluded from the results. Some leaders in the control group delivered some of the sessions; despite this, these schools were included in the control sample. These issues were likely to be due to the difficulties of managing a large sample size (n=5,111).

The United Kingdom's National Institute of Clinical Excellence (NICE) (2007) recommends that, in interventions, practitioners helping people to change health-related behaviour be provided with training to develop skills and competencies. The lack of reporting on training or the reporting of limited training methods in the papers included in this review suggests that implementing comprehensive training is integral to behaviour change interventions. Perhaps just as important, is the reporting of training methods in evaluation reports.

"Measuring skill rather than confidence could provide a true measure of participants' ability"

Sustainability
The frequency and duration of exposure to cooking sessions needed in order to impact on perceived ability and improve confidence is not known. In the literature reviewed, interventions consisted of between five and twenty-three practical cooking sessions over a period of several weeks to one year. While there was some indication of change in knowledge, attitudes, dietary practices and perceived cooking ability, none of the programs included long-term follow-up to determine the sustainability of impacts. Thus, little is known about the impact of longer term programs, or the impact of short-term interventions on long-term knowledge, eating habits or food preparation behaviour in the home.

The US ENFEP paper cited Contento, Balch, Bronner et al.'s (1995) research that concluded that interventions need to be intense and long-term in order to affect behaviour and must use behaviour change strategies. This is a key element of any intervention: the 'dose' and the maintenance of the dose need to be sustained. Many of the studies identified cited the problem of on-going funding as a barrier to this.

Changes in knowledge
All studies that evaluated children's knowledge showed an improvement in knowledge on a variety of topics related to nutrition, healthy eating, and food preparation and safety. The findings suggest that practical cooking sessions are effective in supporting and reinforcing knowledge presented in the classroom and supports the claim that cooking skills are important for understanding what constitutes a healthy diet (Lang & Caraher, 2001). This is consistent with research on children and cooking, which recommends a focus on concrete experiences rather than abstract concepts (Liquori et al., 1998); and is further supported by the general literature on behaviour change, which suggests that knowledge on its own is not a sufficient precursor to change. Rather, there is a need to move from knowledge about what (i.e. food) to knowledge about how (i.e. cooking).

Food selection
The Liquori et al. (1998) and Townsend et al. (2006) studies demonstrated higher scores for food selection or preference for plant foods in intervention groups compared to control groups. The long-term effects of these interventions were not measured however, and this would be key to assessing whether such initiatives have a lasting effect on food selection and preference. Interestingly, Liquori and colleagues found that only children who had participated in the cooking sessions (*Cookshops*) had higher preference scores, while education alone had no effect on preference for plant foods. These data highlight the role of cooking in providing not only practical skills but also a sensory experience

that may influence children's taste preferences and food choices. Sensory education has been shown to increase young people's willingness to try new foods, albeit temporarily (Reverdy, Chesnel, Schlich, Koster & Lange, 2008).

Dietary change

Dietary change was evaluated in three of the four studies (Liquori et al., 1998; Perez-Rodrigo & Aranceta, 1997; Cullen et al., 2007), two of which demonstrated a positive change post intervention. Significantly, these two programs (Liquori et al. and Perez-Rodrigo & Aranceta) were supported by improvements in the diversity and nutritional quality of school lunches.

The *Squire's Quest!* evaluation (Cullen et al., 2007) found that average consumption of fresh fruit, 100% fruit juice and vegetables increased by one portion—diets were assessed over four days. Students demonstrated a preference for fruit recipes goals (50–68%) compared to only 30% who opted for vegetable recipes. In contrast, the Liquori et al. (1998) intervention focused on vegetable foods only, and demonstrated a small increase in consumption. Therefore, targeted interventions aimed at increasing vegetable consumption may result in better outcomes if only vegetable-based recipes are made. This approach is supported by research that indicates that as children have different attitudes to vegetables and fruit, so interventions need to specifically target consumption of one or the other (Thomas, Sutcliffe, Harden, Oakley, Oliver et al., 2003).

Post-intervention consumption data in the *Squire's Test!* intervention (Cullen et al., 2007) were collected using a self-administered 24-hour recall over four days at the end of the ten sessions. Hence, it is unknown whether the sessions impacted on consumption for the medium or longer term. The researchers conclude that food preparation goals may well influence dietary behaviour, however concede that more research is needed to assess transference into the home environment.

Ultimately if the intervention aim is to mediate behaviour change, effective, proven evaluation of long-term impacts and outcomes is key.

Impact of program leader

With the exception of one of the four studies examined, no evaluations considered the impact of the program leader on the success of the program. Only the study by Liquori and colleagues (1998) attempted to address the impact of teachers who were more interested in nutrition or those who had a higher degree of classroom control. In this aspect, intervention and control conditions were matched to be as similar as possible—that is, to ensure that intervention conditions were not systematically assigned to better teachers. Programs cited in the literature involved nutritionists, school kitchen staff, after-school program staff, and parents or other volunteers. A study comparing a nutrition intervention delivered by special resource teachers (SRT) and a comparison group taught by SRTs and regular classroom teachers found that children in the SRT group had better outcomes than the comparison group. The SRT-only group had greater knowledge, greater intent to prepare food, and increased fruit and vegetable consumption compared to the group taught by both SRTs and regular classroom teachers (Auld, Romaniello, Heimendinger, Hambidge & Hambidge, 1999). This result supports the need for specialist training. It would be useful to determine the level of training required to enable non-specialist teachers or non-teachers to be confident and competent in teaching practical cooking.

Children's and parents' views

None of the papers in this review detailed consultation or needs assessment conducted with children. The Evidence for Policy and Practice Information and co-ordinating centre (EPPI-Centre) undertook a systematic review of literature of health promotion in schools guidance (Thomas et al., 2003). Based on their findings, they recommend that interventions be informed by children's views regarding promotion as this can result in a bigger effect. Consulting with children on their needs and their perceptions of the subject matter is crucial as are their views on evaluation methodology.

Parents were engaged in the Spanish study (Perez-Rodrigo & Aranceta, 1997) where they were invited to regular meetings (though attendance was low) and contributed their time as well as by buying an apron, materials and some equipment for their children (for which they were reimbursed).

In the *Cookshop* program (Liquori et al., 1998), some parents helped to deliver sessions and also received a monthly newsletter that gave information on buying, storing and preparing wholegrains and vegetables included in the program.

In the *Squire's Quest!* intervention (Cullen et al., 2007), parents were engaged to the extent that they signed a form to say whether their child had made goal recipes at home.

"Preference for fruit recipes goals (50–68%) compared to only 30% who opted for vegetable recipes"

The EFNEP paper (Townsend et al., 2006) made mention of letters to parents. Based on the information given, this is likely to be the only communication with parents.

Engaging and communicating with parents of participants may provide the essential missing link to transference of eating behaviour and cooking confidence into the home environment.

> "Engaging and communicating with parents of participants may provide the essential missing link"

How to measure cooking ability and more importantly, food preparation in the home

Surprisingly, none of the studies measured cooking skills outcomes directly. However, cooking confidence was evaluated in two programs (Perez-Rodrigo & Aranceta, 1997 and Liquori et al., 1998), both of which assessed self-perceived ability.

In the Spanish study (Perez-Rodrigo & Aranceta, 1997), no detail is given on the scale used.

In the *Cookshop* program (Liquori et al., 1998), questions to children included *'I can make a salad from beginning to end'* with the answers ranging from *'all by myself'*, *'with a little help'*, *'with a lot of help'* or *'not at all'*. Interestingly, the study found that cooking sessions improved cooking confidence in the older primary school children only. This may be due to older children having greater autonomy in the kitchen compared to younger children. The education sessions alone had no effect on cooking confidence, although it should be noted that the content of the 'Food and Environment' lessons in the *Cookshop* program was not focused on cooking theory but rather on learning about whole foods in a healthful diet and sustainable eating practices. In this instance, it may be that cooking was a means to an end as opposed to an end in itself—that is, a means to achieve healthy eating. This approach was intended to supplement the teaching of cooking by promoting an awareness of the origin of food and its connection to the environment. Cooking skills confidence may be a key motivator to transference of skills and therefore eating behaviour into the home environment.

Of the four programs included in this review, two of them (Liquori et al., 1998 and Perez-Rodrigo & Aranceta, 1997) evaluated perceived cooking ability/confidence. However, we know little about the association between perceived cooking ability/confidence and actual food preparation behaviour. None of the studies evaluated cooking ability by direct observation. With the exception of one study, questionnaires were the primary method for obtaining data. Only the study by Cullen and colleagues (2007) asked for parent confirmation that children had prepared a recipe at home. However, this method was not validated and no data were collected regarding access to ingredients and/or equipment at home or how the parent supported the activity. More research is needed to determine whether this exercise would be effective in encouraging food preparation at home. This link is crucial as food preparation in the home is associated with better diet quality in young people (Larson, Story, Eisenberg & Neumark-Sztainer, 2006). Preliminary work is needed to develop and test instruments for measuring this outcome.

Cooking in schools: imparting a life skill or preventing obesity?

The review findings demonstrate little, if any, evidence of long-term impact on outcomes such as cooking skills and dietary behaviour, let alone any links between cooking education and obesity prevention. Yet in developed countries such as the United Kingdom, obesity prevention strategies are including school cooking initiatives without true knowledge of what works, nor robust evaluation of many of these new initiatives.

The home economics approach to food and nutrition education aims to teach young people the life skills and knowledge needed to provide themselves and future families with a healthy diet. But this is just part of the picture. The wider social environment needs to support this through food culture, food access and cost, marketing and even agricultural policy, otherwise such practical education is not enough in itself to mediate change.

Conclusions

The lack of both quality and quantity of the evidence in relation to the area is of great concern. The evidence base for successful outcomes is lacking. That is not to say that cooking does not have an impact on eating behaviour and/or cooking skills but simply that the best evidence we have at the moment is insufficient to answer this question.

Cooking skills, we believe, have an important part to play in equipping young people and adults with the practical 'how to' knowledge and skills necessary to achieve healthy eating practices. However, if the aim of cooking initiatives in schools is to tackle poor eating habits, this should be one of a myriad of approaches rather than a single intervention.

While several studies have shown an association between food preparation and healthy eating

behaviour (Lang & Caraher, 2001; Caraher & Cowburn 2004; Larson et al., 2006), this review has identified the need for further research, specific to school-based cooking initiatives. None of the four key studies measured cooking skills but used other proxies and generally sought to teach or impart cooking skills to achieve other ends. This latter approach comes with a danger that if it does not achieve these outcomes—for example, increase in fruit and vegetable intake or reductions in obesity—then cooking will have been judged to have failed. There is scope for future studies to identify the importance of cooking to young people as an essential life skill in its own right. Previously, cooking education in schools, particularly in home economics classes, would impart these life skills, supported by a home and social environment where cooking from fresh ingredients was the only way to feed oneself. The social context has changed, there is no doubt. If cheaper, convenient fast foods are more readily available than fresh ingredients, what choice is there and what influence can practical cooking sessions have? As such, cooking education in schools has an important role to play in imparting the knowledge and skills needed to feed oneself well. However it cannot be a panacea and long-term impacts and outcomes need to be better understood within the context of the wider social environment through robust evaluation.

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